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MILK FEVER: ITS SIMPLE AND SUCCESSFUL TREATMENT.

PRELIMINARY REMARKS.

Milk fever is a very common, and until recently a frequently fatal, disease affecting cows in all the large dairy districts of this and other countries. As it usually attacks the best milking members of the herd and at a time when the milk flow is the heaviest, the malady is one which has caused very severe losses to our dairy industry. It is therefore of the greatest economic importance that every milk producer acquaint himself with the present extremely successful methods of treating this disease, especially the injection of filtered atmospheric air into the udder. This form of treatment has been adopted within a comparatively recent time, and, in view of the uniform success that has followed, every dairyman should become familiar with its use and should provide himself with a suitable apparatus for its application, especially if he is located where the services of a competent veterinarian can not be secured. This method of dealing with the disease does not make the assistance of the veterinarian undesirable, in case it is obtainable, as the professional man may frequently be of the greatest assistance in treating complicated symptoms, should they arise.

NAME AND SYNONYMS.

The common name for this malady—milk fever—is an erroneous and misleading one, as in reality fever is usually absent; instead, there is generally an actual reduction in body temperature. A far better and more distinctive term and one that describes the actual condition much more precisely is parturient paresis. The disease has also several other names in various parts of the country, such as calving fever, parturition fever, parturient apoplexy, parturient collapse, puerperal fever, vitulary fever, dropping after calving, puerperal septicemia, and puerperal eclampsia.

DESCRIPTION OF DISEASE.

Milk fever is a disease of well-nourished, plethoric, heavy-milking cows; it occurs during the most active period of life (fourth to sixth calf), and is characterized by its sudden onset, the complete paralysis of the animal with loss of sensation, and by following closely the act of parturition, terminating rapidly in recovery or death. One attack predisposes the animal to a second and even a third recurrence of the

trouble. While this disease may occur at any time during the whole year, it is seen principally during the warm summer season. The affection is almost entirely confined to the cow, although a few cases have been reported in the sow and goat. Sheep are entirely free from the disease.

PREDISPOSITION AND CAUSE.

There are few diseases among our domesticated animals regarding the exact cause of which more widely different theories have been advanced than that of milk fever. The causes may properly be divided into two kinds—predisposing and direct. Clinical experience shows the most prominent predisposing causes to be, first, the great activity of the milk-secreting structure, namely, the udder. This organ is most active after the fourth, fifth, and sixth parturition, and this is the time of life when the vast majority of animals are attacked. The disease is almost unknown in heifers with their first calf and decreases in frequency steadily after the most active milking period is past. It is rarely, if ever, met with in pure beef breeds, such as the Shorthorn, Angus, and Hereford, while its main inroads are made into the heavy-milking breeds, such as the Holstein, Jersey, and Guernsey. Another factor that is probably of equal importance with the activity of the udder in producing the disease is the existence of a plethoric condition of the system, the result of excessive feeding and lack of exercise before calving. In heavy-milking cows all the food ingested in excess of that required to make up for the normal waste of the system is turned into milk and not used for the laying on of flesh or fat. Fleshiness is therefore an unnatural condition in these animals and the period during which they are "dry" is usually very short; indeed, many of these cows continue to secrete milk right up to the time of calving. In those cases where the animals go dry, the excess of nutriment in the food has no avenue of escape and immediately becomes stored up in the glands and in the blood, throwing the system into a high state of plethora. Now at the time of parturition all the blood which has been supplying the fetus is suddenly thrown back on the circulation, and if the udder does not begin active secretion very promptly plethora becomes extreme. The blood plasma under these conditions is very rich and dense, containing a large percentage of albumen and glycogen, and causing a shrinkage in size of the blood cells. This condition is invariably seen when the blood of milk fever patients is examined under the microscope.

Fatness of the animal has been ascribed an important place in the causation of milk fever. This, however, in itself is probably not a predisposing cause, as, if we again look to the beef breeds (Angus and Shorthorn) they are always in far better condition at the time of parturition than the milking breeds (Jersey and Holstein), and yet milk

fever is a rarity in the former. At the same time it must not be understood that a fat Jersey is not more predisposed than one poor in flesh. In the fat Jersey the system already is loaded with an excess of nutriment and at the time of calving extreme plethora is more readily produced than in the thin animal where the excess of nutritive elements could be more readily used and stored in the depleted muscular and glandular structures of the body. Fatness is therefore only of importance in the production of the disease in so far as it tends to increase glandular activity, particularly of the udder, and because of the higher state of plethora of the fat animal.

Among the theories regarding the more direct causes of the malady may be mentioned, first, the action of invading bacteria gaining access to the uterus during parturition. The parturient uterus is certainly an exceedingly favorable breeding ground for bacteria, but this theory can hardly be substantiated by clinical evidence. The disease is very common after a normal or easy parturition where no assistance in the expulsion of the fetus is required; consequently no germs are introduced into the womb by the hands of the attendant and the uterus retracts to its normal dimensions rapidly. On the other hand, it is practically never seen after abortions, difficult parturitions, and abnormal presentations of the fetus, in many of which cases innumerable bacteria must be carried into the uterus by the hands of the operator and his instruments. It would seem that the great loss of nervous energy and the subsequent exhausted condition dependent upon difficult parturition act as a preventive to the development of the disease. Bacteria have been found in the blood, and the ordinary pus-producing germs and a variety of the colon bacillus have been recovered from lochia and uterine discharges by several foreign investigators. These organisms, however, upon isolation and inoculation into susceptible animals, have never authentically reproduced the disease, and consequently the theory that bacteria play an important part in the etiology of the disease is by no means indisputable. Since the highly favorable results obtained by the injection of air into the udder, it has been suggested that its beneficial action is due to the fact that the organism producing milk fever is an anaerobe (a germ unable to live in the presence of air) which invades the mammary gland, but this theory is hypothetical and requires further investigation. If this should prove true it is probable that this anaerobic organism remains localized in the udder, like the bacillus of tetanus remains localized at the point of injury, and produces a highly potent toxin which, when absorbed into the system, has a specific affinity for the nerve centers.

Bentele in the early part of last century considered that this disease was due to milk metastasis and he described postmortem lesions where milk emboli were found in various parts of the body and where milky urine was voided. This, however, has never been observed by more

recent investigators, and probably is without scientific foundation. In 1874 Harms, of Hanover, published the results of his investigations in which he claims the symptoms were produced by infarction of the brain due to air gaining access to the general circulation through the ruptured veins in the uterus at the time of parturition. This theory, however, is at present discarded, as it is known that there is a positive pressure in the uterine veins, while a suction action, or negative pressure, would be indispensable for the entrance of air. The air found by Harms was probably produced by the gas formation within the blood vessels after death, resulting from the decomposition of the blood. Numerous other theories have been advanced by various investigators, but only to be abandoned as further discoveries in pathology were made. Thus Schmidt, of Mühlheim, basing his theory upon the striking resemblance of the symptoms of milk fever to those of sausage poisoning, claimed that the former was due to an auto-intoxication produced by the absorption of toxins from the uterus. This was a great advance over the theories which up to this time had been considered. However, the medication recommended by this writer, which aimed at the antiseptic treatment of the womb, failed to decrease the great mortality of the disease and his theory was finally entirely superseded in 1897 by that of J. Schmidt, of Kolding, Denmark. This able investigator first directed attention towards the udder by claiming (as Schmidt, of Mühlheim had done) that the disease was an auto-intoxication, but produced by the absorption from the udder of leucomaines, resulting from the decomposition of the first milk (colostrum). Following up this idea Schmidt considered that the treatment should be directed toward retarding the secretion of the udder and at the same time neutralizing the leucomaines or toxins already present, by the use of some antitoxic agent. He therefore advocated the injection of the udder with an aqueous solution of potassium iodide, which method was followed by an immediate decrease in the mortality to a very marked degree. The great success attendant upon this line of treatment at once gave the theory general recognition, and this very difficult problem was at last thought to be elucidated. Within the last few years the injection of etherized air, oxygen, and sterile atmospheric air have been used with wonderful success, reducing the mortality much lower than the potassium iodide had done. It therefore seems that a thorough distention of the udder with the consequent decrease in its circulation is far more important than the antitoxic action of potassium iodide. This use of the gaseous injections, although it has reduced the mortality to a minimum and has completely divested the dread disease of its deadliness, has at the same time revived the previously rejected theory of anemia (bloodlessness) of the brain. However, the causation of this affection still requires much more investigation.

SYMPTOMS.

This disease in its typical and most common form is comparatively easy to diagnose and one which almost every dairyman knows immediately, before the arrival of the veterinarian. It usually comes on within two days after parturition and is practically never seen after the second week. In isolated instances it has been observed a few days before calving. At the commencement of the attack there is usually excitement; the animal is restless, treads with the hind feet, switches the tail, stares anxiously around the stall or walks about uneasily. It may bellow occasionally, show slight colicy symptoms, and make ineffectual attempts at defecation. These symptoms are rarely recognized by the owner, but they are rapidly followed within a few hours by beginning paralysis, noticed by a staggering gait, especially in the hind

FIG. 1.—Cow affected with milk fever.

legs, and by weakening of the knees and fetlocks in front. The patient now becomes quieter, the gait more staggering and weak, and finally the animal goes down and is unable to rise. The paralysis by this time is general, the calf is unnoticed and the cow lies perfectly quiet with the eyes partly closed and staring, and showing a complete absence of winking when the eyeball is touched. The animal is absolutely unheedful of its surroundings and flies may alight with impunity on all parts of the body without causing the slightest movement to dislodge them. While down the patient assumes a very characteristic position (see fig. 1), which is of great aid in diagnosis. The head is turned around to the side (usually the left) and rests on the chest, causing a peculiar arching of the neck. If the head is drawn out straight it

immediately flops around to the side again when the force is removed. The body usually rests slightly to one side, with the hind legs extended forward and outward and the fore legs doubled up in their normal position. There is paralysis of the muscles of the pharynx, so that swallowing is impossible, and in case drenching is attempted there is great danger of the fluids going into the lungs and setting up traumatic pneumonia. Paralysis of the rectum and bladder is also complete and the movement of the intestines is so suppressed that purgatives are frequently powerless to reestablish it. Fermentation in the paunch with consequent bloating is sometimes seen, particularly when the patient is allowed to be stretched out on her side. The secretion of milk is diminished and may be suspended entirely. Sugar is voided in the urine, depending in quantity on the severity of the attack. The pulse is weak and at times hardly perceptible to the finger, averaging from 50 to 70 beats per minute. Later in the disease, however, and especially in those cases with unfavorable terminations, it may reach 100 per minute. There is seldom noticed a rise of temperature. Sometimes at the commencement of the attack the temperature may reach 103° F., but there is a steady decrease to as low as 95° F. as the disease progresses. The temperature rapidly rises again as improvement is manifested. Convalescence occurs rapidly, and on the day following the onset of the disease, and in some cases even within a few hours, the animal may be up eating and drinking in a normal manner. Sometimes, however, a slight paralysis of the hind quarters persists, and may remain for a week or even longer, indicating that some structural change must have occurred in the nerve centers. In fatal cases the animal may remain perfectly quiet and die in a comatose condition from complete paralysis of the nervous system, but more frequently there is some agitation and excitement prior to death with tossing about of the head. Death, like recovery, usually occurs rapidly—in from eighteen to seventy-two hours after the onset of the malady.

APPEARANCE AFTER DEATH.

The postmortem appearances in an animal dead of this disease are frequently entirely negative and not in the slightest degree characteristic. This further upholds the theory that milk fever is an intoxication and not a bacterial infection, as in the latter case the lesions would be more marked and distinguishable. The postmortem also fails to substantiate the fermentation theory of Schmidt-Mühlheim, as the uterus is generally found contracted and its mucous membrane intact. The third stomach is sometimes found impacted with dry, hard masses of food and there may be some fermentation in the intestine. Sugar in varying percentage is always found in the urine in the bladder as well as in that drawn prior to death. Various particles of food may be found in the larynx together with congestion and edema of the mucous mem-

brane of the trachea and bronchi. Pneumonia, traumatic in origin, may also be observed if drenching has been attempted after paralysis of the pharynx has occurred. The blood is usually dark and thick and congestion of the spinal cord and base of the brain are also quite frequently present.

PROGNOSIS AND MORTALITY.

Prior to the introduction of the Schmidt treatment the prognosis of parturient paresis was exceedingly grave and the mortality was placed by various authors from 40 to 50 and even 70 per cent. However, after the introduction and general application of potassium iodide injections into the udder, the mortality was reduced in Denmark and Germany to 17 per cent, in Switzerland to 22 per cent, Austria to 25 per cent, while in this country the statistics collated at the Iowa Experiment Station show 119 recoveries without complication out of 166 cases, a mortality of 28 per cent. Since the use of sterile atmospheric air for the injection of the udder, the death-rate is even much lower than with the potassium iodide treatment, and in Denmark out of 914 patients, 884, or 96.7 per cent, recovered. In general, the nearer the attack follows the act of parturition the more severe it proves and the graver the prognosis. The severity also greatly increases with each subsequent attack.

TREATMENT.

In the administration of medicine by the mouth, and especially drenches, great care should be taken to prevent the fluids from getting into the larynx and from there into the lungs where they will set up traumatic pneumonia, which is almost invariably fatal. In case the pharynx is not paralyzed the drench may prove of value and should be given slowly and immediately stopped at the first sign of uneasiness or coughing on the part of the animal. While the patient lies on the side she must raise the weight of her body at each inspiration, which is very exhausting, and hypostatic congestion of the dependent lung is greatly favored. Consequently it is of importance that the cow should be kept propped up on the sternum by means of bags of chaff or straw placed against her side. In the way of medicinal treatment purgatives are indicated and may be given in the first stage of the disease when the animal can swallow, with the precautions above mentioned. One pound of Epsom salts and 2 ounces of creolin dissolved in a pint of water will prove beneficial. The creolin is added for its antiseptic action to prevent fermentation in the paunch with the consequent danger of the eructation of foods and their subsequent passage into the trachea. Ammonium carbonate in 2-dram doses dissolved in 2 ounces of water will be found to act equally as well as the creolin in this respect. Epsom salts is rather slow in its action, and a subcutaneous injection with a hypodermic syringe of 1½ to 2 grains of eserine sulphate, when obtainable, will be found quicker and more efficacious. The rectum

should be emptied and injections of 1 to 2 gallons of warm water given to stimulate intestinal movements. However, the lost peristalsis is exceedingly hard to reestablish and sometimes defies all efforts in that direction. The urine should be drawn with a catheter or by pressure on the bladder with the hand in the rectum, as the bladder is paralyzed and unable to empty itself.

The feeble pulse and subnormal temperature call for the administration of stimulants. Subcutaneous injections of 1 dram of the following solution every three hours are probably the most efficacious: 80 grains of caffein, 60 grains of sodium salicylate, and 4 drams of water. Similar injections of 1 grain of strychnia sulphate three times daily will also be found very beneficial, although numerous other drugs may be recommended, as spirits of camphor, veratrin, tincture of digitalis, alcohol, etc. In case the animal is very excitable the head should be restrained in such a manner as to prevent injury, and in case the violence becomes excessive, 1½ ounces of chloral dissolved in a quart of water per rectum, or 5 grains of morphine sulphate subcutaneously, may be administered.

THE POTASSIUM IODIDE TREATMENT.

As previously stated Schmidt, of Kolding, advanced the theory in 1897 that the cause of milk fever was the absorption of leucomaines from the udder, and recommended that potassium iodide be injected to prevent the formation of the toxin and to neutralize that already existing. This was the most rational theory so far advanced and the treatment proved to be beneficial, being followed by astonishingly good results. After this treatment was generally resorted to throughout Europe and America the mortality fell from 40 per cent to 17 per cent. The apparatus required for the Schmidt treatment is exceedingly simple and consists of a piece of rubber tubing about 4 feet long, to one end of which is attached an ordinary milking tube. This is inserted into the teat and at the other end a funnel is fitted, into which the solution is poured. Previous to the injection the udder should be thoroughly milked out and washed off with warm water and soap followed by a 5 per cent solution of carbolic acid or creolin. A clean towel should be placed under the udder to keep it from coming in contact with the stable litter or other filth. Two and one-half drams of potassium iodide are then added to one quart of water previously boiled for fifteen minutes and allowed to cool to the temperature of the body. The funnel and tubing should likewise be disinfected before the injection. The milking tube is inserted into the four teats in succession, each quarter of the udder, after it has been milked out clean, receiving one-half pint of the liquid. The udder should then be thoroughly massaged to make sure that all the milk canals are penetrated by the liquid. In case improvement does not occur the injection may be repeated once or twice at intervals of eight hours, always observing the same antiseptic precau-

tions, as it is possible to produce a dangerous mammitis (caked bag) and ruin the udder by careless injections which introduce pathogenic bacteria. This danger, however, is entirely obviated by the use of ordinary antiseptic precautions, as described above.

THE NEW AIR TREATMENT.

Of all known methods of treating milk fever, the injection of sterile atmospheric air into the udder is by far the most simple and practicable as well as the most efficacious and harmless one at our disposal, and only occasionally requires the concurrent use of medicinal treatment.

For a considerable length of time the entire value of Schmidt's treatment was considered to be the antitoxic action of potassium iodide, and soon numerous investigators began injecting various other antiseptics with equally good results. Sterile water was tried with no increase in the mortality, and it was therefore considered that the distention of the udder was as important a factor as the antitoxic action of the iodide of potash. Continuing along these lines, Kortman used antiseptic gases (etherized air) with beneficial results. Oxygen was then tried by Knüsel with increasing success and the mortality in the experimental cases virtually disappeared. The apparatus for treating with oxygen and etherized air, however, are expensive and cumbersome, and this greatly limits their use by the average practitioner. To Andersen, of Skanderborg, belongs the credit of first having made use of plain atmospheric air. He first injected it along with sterile water and then by itself. The results were astonishingly successful. Thus Schmidt reports that out of 914 cases treated in Denmark, 884, or 96.7 per cent, were restored to health. The record of 140 of these animals shows that recovery occurred in the average time of $6\frac{2}{3}$ hours. Of this number 25 cases required a second injection, while in 3 of the latter number it was necessary to give a third treatment before they were able to get upon their feet. The treatment is also practically harmless, as the statistics of the above mentioned 914 patients show that only 1 cow was affected with a severe attack of mammitis after this treatment, while in 4 other cows a milder inflammation of the udder was apparent. Equally good results have likewise been obtained in this country.

The method of injecting filtered air into the udder is easy of manipulation, requires but little time and is readily accomplished by means of a milk fever apparatus, such as is illustrated in fig. 2.[1] It consists of a metal cylinder *f* with milled-screw caps *c* and *d* on either end. Cap *c* is for the purpose of removing in order to place sterile absorb-

[1] Persons desiring the name and address of firms manufacturing milk-fever outfits, together with the price of same, will be furnished with such information upon application to this office.

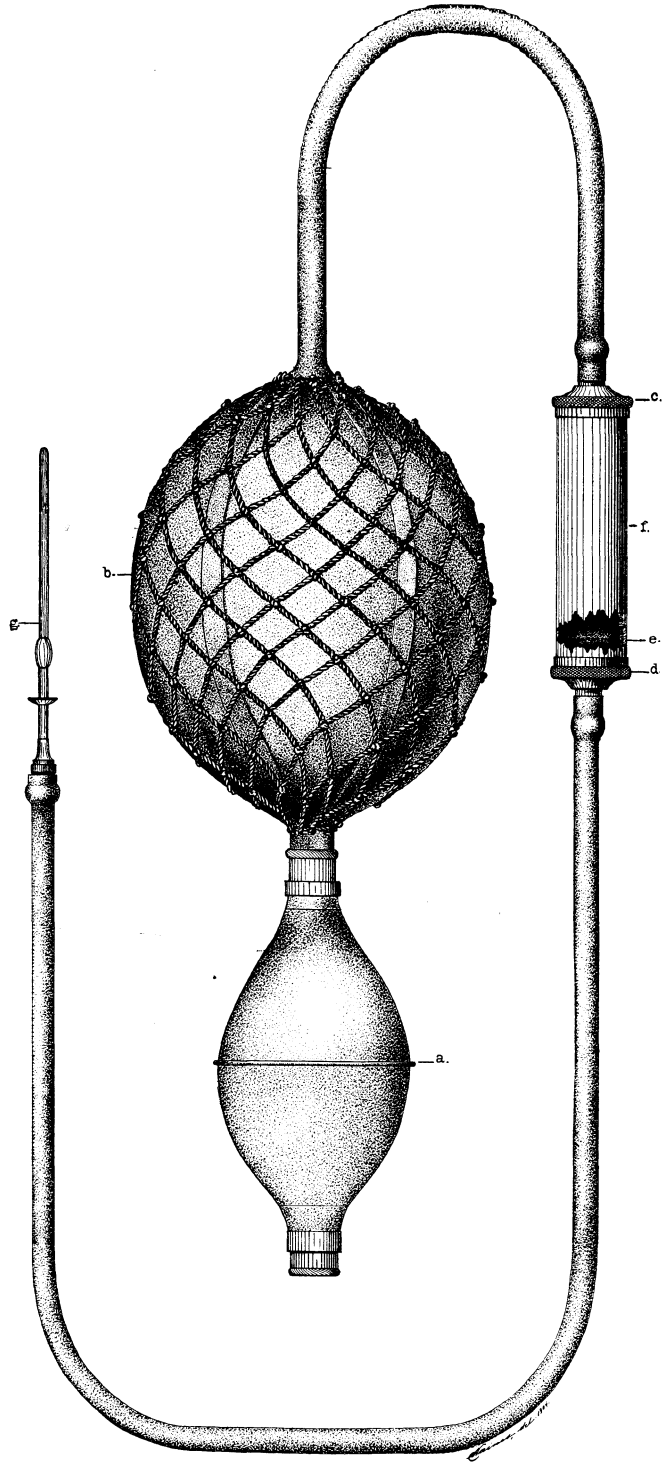

FIG. 2.—Apparatus for injecting sterile atmospheric air into the udder.

ent cotton within the chamber and to which the rubber bellows *a* and *b* are connected by 9 inches of rubber tubing. Cap *d* is to be removed together with the attached 18 inches of rubber hose, at the free end of which is the self-retaining milking tube *g*, for the purpose of disinfection before treating each case. The pulling on or off of the tubing on the nozzles of the milled caps is thus rendered unnecessary. Within the metal cylinder at *e* is a wire net, which prevents the obstruction of the outlet of the chamber by holding back the sterile cotton, and also permits of the unscrewing of the lower cap and the disinfection of this portion of the apparatus, including the milking tube, without contaminating the packing. Absorbent cotton impregnated with carbolic acid (carbolized cotton) or other medication can be purchased from the drug trade in most localities, and is better, though slightly more expensive than the plain cotton.

Previous to making the air injection the hands of the operator should be thoroughly cleansed and the udder should receive the same careful antiseptic treatment as is recommended before injecting potassium iodide. Soap and water should be applied to the teats and udder, following which they should be carefully disinfected with a 5 per cent solution of carbolic acid (3 tablespoonfuls of pure carbolic acid to 1 quart of water). A clean towel should then be placed under the udder to prevent the teats from coming in contact with dirt or filth of any kind. The milking tube, before it is placed in the teat, should have been perfectly sterilized by boiling for 15 minutes, with the lower hose and milled cap of the cylinder attached, and the apparatus wrapped in a clean towel, without touching the milking tube, to prevent contamination before use. If the apparatus has been subjected to this treatment shortly before and it is desired to disinfect only the milking tube the latter may be placed in a 5 per cent solution of carbolic acid for 5 minutes. It is then carefully inserted into the milk duct of the teat without emptying the udder of milk. Air is now pumped from the bulb *a* into the reservoir *b*, and thus a continuous flow of air is forced through the filtering chamber and into the udder. Slight massage or kneading of the udder will cause the innermost recesses of the milk tubules to become distended with the injected air. After the quarter is well distended and sufficiently tense the milking tube is removed, care being taken to prevent the outflow of air by having an assistant tie a broad piece of tape about the teat at the time the milking tube is withdrawn. The same treatment is repeated in the other three teats until the udder is satisfactorily distended. In case the air becomes absorbed and no improvement is noted within five hours, a repetition of this treatment should be made under the same antiseptic precautions as at first. The tape should be removed from the teats two or three hours after the cow gets on her feet, the constricting muscles at the tip of the teats being now depended on for retaining the air. In this manner the air may be

left in the udder for twenty-four hours, and when recovery is assured, it should be gradually milked out. It is needless to say that the calf should not be permitted to suckle during this period.

Inflammation of the udder (caked bag) is avoided if the milking tube is thoroughly disinfected before each application, and if the mammary gland and the hands of the operator have been properly cleansed. If the apparatus is kept in its case free from dust and dirt, the absorbent or medicated cotton in the metal cylinder will efficiently filter enough air to distend the udder of six cows. After this number has been treated it is advisable to replace the old cotton with a fresh sterile supply, which should be placed loosely into the cylinder.[1]

While this method of treating milk fever is a comparatively easy one for a layman to adopt, he can not expect to have the same successful results as those obtained by a skilled veterinarian, and it is therefore advisable that the services of such a veterinarian should always be obtained in those districts where it is possible. In many cases it will be found that the injection of air into the udder will be sufficient to combat the disease without any contemporary treatment, but it is always advisable to study the symptoms of each individual case and administer in a rational manner the indicated medicines.

PREVENTION.

Up to within recent times most stringent measures were resorted to by every careful dairyman to prevent the development of the disease in his herd. However, since the treatment of the present day has so greatly reduced, and even in some cases obliterated the mortality, prevention is no longer such an important problem and therefore preventive measures which have a severe and lasting effect upon the animals should be abandoned from an economic standpoint. It has long been advocated to starve all suspected animals for two weeks prior to the end of their terms of gestation. It is frequently noted that this has an injurious effect on the milk flow of the animal, from which it may require several weeks for her to recover and gain her normal output of milk. This measure is no longer considered economic, as it is better to have cows attacked with the disease once in a while (the mortality being less than 5 per cent) than to decrease the flow from every heavy milking cow for from one to three weeks after parturition by starving the animals during the antiparturient state.

A method which is not quite so sure of reducing the plethoric condi-

[1] A number of bacteriological tests were made in order to determine the efficiency of the absorbent cotton in the cylinder to filter out the microorganisms from the atmospheric air. For this purpose agar plates and slant agar tubes were used and the results obtained proved the absolute certainty of this quantity of cotton filtering successfully a sufficient volume of air to distend six good-sized udders.

tion of the cow, but which nevertheless proves very efficient and is without the slightest permanent injurious effect, is the administration of 1 to 1½ pounds of Epsom salts two or three days prior to calving. In case this has been neglected and a well-nourished, heavy-milking cow has passed through an easy nonexhausting parturition, the administration of the salts after the labor is over should by no means be neglected. Blood-letting has also been advocated, but there is always the danger of exciting the blood-making organs to excessive activity and thus reducing the depleting action of the measure to a minimum. It should therefore be resorted to only when the cow is extremely fat, is a heavy milker, and has had one or more attacks at previous parturitions. The blood should be drawn from the jugular vein and continued until the pulse softens perceptibly, or about 1½ pints for every 100 pounds of the animal's body weight.

Another very good preventive measure, and one easily carried out, which is frequently overlooked, is to give the cow plenty of exercise up to the time of calving. Many animals are allowed to run continuously on pastures from the time they go dry until a week or two before calving, when they are transferred to the stable without any subsequent exercise, which is very conducive to the enriching of the blood and the development of the disease.

The most recent preventive treatment suggested is in line with the favorable results obtained by the intramammary injection of air. It consists in allowing the susceptible cow to retain in the udder for 24 hours following parturition all the milk except the small quantity required by the calf, which should be taken if possible from each quarter. The distention of the udder naturally follows as in the air treatment and acts as a preventive against milk fever. In the Island of Jersey and at the Biltmore Farms, N. C., where this practice is common, the number of milk fever cases has been greatly lessened. General sanitary conditions should also be looked after, such as the supply of pure air and clean stabling, with plenty of clear, cool water and laxative foods, like grasses and roots. Some observers who believe in the microbic origin of the disease have recommended the cleaning of the manure and dirt from the animal and spraying the hind quarters and genitals with a 4 to 5 per cent solution of carbolic acid, lysol, or creolin, just prior to calving. From our present knowledge of the disease, however, this is probably superfluous.

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